From the sea… to outer space: the command of space as the foundation of spacepower theory

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Abstract

Colin Gray once lamented the absence of a 'Mahan for the final frontier' and spacepower theory in strategic studies. This article proposes the command of space as the fundamental concept of spacepower theory, and that Mahan himself has much to offer in the endeavour of spacepower theory-making than has hitherto been realised. The theory is advanced by tempering versions of the 'command of space,' stressing its educational intent, and explaining the nuanced sub-concepts of space control and denial through understanding some precedents set by seapower theory. In the process, aspects of Mahanian and Corbettian seapower theory are unified.

Keywords: space warfare, spacepower, military strategy, strategic theory, seapower

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Introduction

'[Some] naval officers… have admitted to me that the reason they joined the Navy was because Starfleet Command wasn't hiring.' – Chris Weuve[1]

In the quarter of a century since the Global Positioning System (GPS) guided the U.S. VII Corps through the featureless Iraqi desert to smash Saddam Hussein's forces in the first Gulf War, satellite networks have become ever more integral to military, economic, and political power. Spacepower – the use of outer space for political ends – is proliferating horizontally and vertically.[2] States rely on over 1,300 satellites to enable precision warfare as well as precision agriculture.[3] In addition to the proliferation of spacepower within states and economies, Earth's major space powers are developing their space warfare capabilities.[4] Yet more than 25 years after the 'First Space War,' spacepower theory is still a small subfield in strategic studies.[5] No theoretical framework to aid discussion and education about space activities or even to explain what 'it is all about' exists.[6] The previous commander of US Air Force Space Command and now commander of US Strategic Command, General John Hyten, has emphasised the need for further education in space warfare operations among his ranks.[7] However, the 'Space Mission Force' initiative does not appear to engage with the higher strategic levels of thought about spacepower and space warfare. A strategic education in the meaning of spacepower is sorely needed, and can be provided by spacepower theory. In 1996, Colin Gray pleaded for an Alfred Thayer Mahan for the final frontier, yet this call went largely

[1] Michael Peck, 'Aircraft carriers in space,' Interview with Chris Weuve, *Foreign Policy*, 28/09/2012, http://foreignpolicy.com/2012/09/28/aircraft-carriers-in-space/ (accessed 09/09/2016)
[2] See: Robert C. Harding, *Space Policy in Developing Countries* (Abingdon: Routledge, 2013)
[3] For an overview of satellite uses, see: U.K. Ministry of Defence (MoD), *The UK Military Space Primer* (Shrivenham: Development, Concepts, and Doctrine Centre, 2010); Air Command and Staff College Space Research Electives Seminars, *AU-18 Space Primer* (Montgomery: Air University Press, 2009)
[4] On an overview of antisatellite testing, see: Brian Weeden, 'Through a Glass, Darkly: Chinese, American, And Russian Anti-satellite Testing in Space,' (Washington, D.C.: Secure World Foundation, 2014)
[5] The term 'First Space War' first appeared in: Peter Anson and Dennis Cummings, 'The First Space War: The Contribution of Satellites to the Gulf War', *RUSI Journal* 136:4 (1991) 45
[6] Colin S. Gray, 'The Influence of Space Power Upon History', *Comparative Strategy*, 15:4(1996) 304
[7] John E. Hyten, 'Space Mission Force: Developing Space Warfighters for Tomorrow', US Air Force, 29/06/2016.

unanswered: there has only been a piecemeal effort to create spacepower theory in the strategic studies community.[8]

This article attempts to fill that lacuna. It argues that the 'command of space' is the fundamental concept to strategise about space warfare and theorise further on the role of spacepower on a grand strategic level. Some of the classical works of strategic theory have far greater applicability to the new environment than has hitherto been appreciated. Like the command of the sea, the command of space signifies the degree to which one party can use a medium for itself and/or deny it to another. It therefore applies and adapts aspects of traditional sea power theory to form the basis of a new framework for understanding and interpreting space warfare. This article is primarily concerned with triggering and encouraging constructive strategic thought about outer space by developing the founding concept of strategic theory – the command of space. This article is not an in-depth analysis of the entirety of seapower theory and its applicability to outer space.[9] The first section of the article clarifies key terms for spacepower theory in strategic studies. Then, it describes the educational intent of spacepower theory before articulating the headline concept of the command of space in its basic form, with its two sub-concepts of space control and space denial. As the primary contribution of this research is to advance spacepower theory, the command of space is described on its own terms before exploring its analogical origins in seapower theory. The similarities of Mahan and Corbett's seapower theories are explained to add nuance to the meaning of commanding space. Thereafter, the commonalities between Mahan and Corbett's seapower are further elaborated to theorise other aspects of spacepower: the permeability of command; the unity of theory in sea and space communications; the contingent decisiveness of commanding space for war on Earth; and the contingent decisiveness of battle in space.

[8] Gray, 'The Influence,' 307

[9] For a survey of seapower and airpower analogies to outer space, see: John B. Sheldon, *Reasoning by Strategic Analogy: Classical Strategic Thought and the Foundations of a Theory of Space Power*, PhD Thesis, University of Reading, 2005.

The trouble with terminology

Whilst there have been valuable contributions in a collective effort of spacepower theory-making since 1991, they do not propose a comprehensive theoretical structure that can be applied across a range of time periods and scenarios to improve judgment and critical analysis.[10] This is partly because there is little discussion and consistency in the small spacepower literature as to what key terms such as 'strategy,' 'strategic theory,' and 'spacepower theory' mean. Gray conceived strategy as merely the 'use that is made of force and the threat of force for the ends of policy.'[11] Strategy's holistic nature has meant that it has been employed in problematic terms by some authors in the spacepower literature, and conflated with strategic theory.

Strategic theory is a summation of ideas, concepts, and propositions that should assist an individual's development and practice of strategy, but not a ready-to-use strategy. Strategic theory achieves this by promoting self-education and the critical application of propositions or ideas to scenarios to develop independent and creative strategic thought that enable one to develop practical solutions or insights to a problem at hand.[12] This is what Gray means by theory fuelling understanding for practical benefit.[13] Spacepower theory, then, should embrace, explain, and connect the many different uses of spacepower in the service of space strategies, and should view strategic theory as geared towards helping practice.[14] Spacepower theory achieves this through the concept of the command of space, which connects any acts of space warfare to grand strategic thinking and the myriad contributions of spacepower to an overall war effort. Strategic theory, of which spacepower theory is a type and specification, can help students and analysts of war make sense of spacepower

[10] For example: Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age* (Abingdon: Frank Cass, 2002); Michael V. Smith, *Ten Propositions Regarding Spacepower* (Montgomery, A.L.: Air University Press, 2002); John J. Klein, *Space Warfare: Strategy, Principles, and Policy* (Abingdon: Routledge, 2006); John B. Sheldon and Colin S. Gray, 'Theory Ascendant? Spacepower and the Challenge of Strategic Theory', in: Charles D. Lutes et al., ed., *Toward a Theory of Spacepower: Selected Essays* (Washington, D.C.: National Defense University Press, 2011). Note that the digital version of this edited volume does not contain pagination
[11] Colin S. Gray, *Modern Strategy* (Oxford: Oxford University Press, 1999) 17
[12] Jon Sumida, *Inventing Grand Strategy and Teaching Command: The Classic Works of Alfred Thayer Mahan Reconsidered* (Washington, D.C.: Woodrow Wilson Center Press, 1997) xv-xviii, 6-7, 44, 67, 69
[13] Colin S. Gray, *Airpower for Strategic Effect* (Montgomery, A.L.: Air University Press, 2012) 10
[14] Sheldon and Gray, 'Theory Ascendant?'

with existing concepts from terrestrial experience whilst encouraging creative strategic thought and sound judgment.

The spacepower literature can be imprecise when using central terms such as 'space strategy' and 'spacepower theory.' John Klein's terminological ambiguity detracts somewhat from his useful analogising of Corbett's theory to outer space.[15] This terminological imprecision is a problematic basis for grappling with the differences between an applied strategy and course of action for a particular scenario in a place and time (a space strategy) and an abstract universal strategic theory that provides concepts to help devise a strategy through education (spacepower theory). Klein's welcome contribution to spacepower theory is assailed by a lack of clarity over whether he intended to develop a plan for the United States in space, or a treatise to help people make plans for the United States in space. Using Gray's definition of strategy above, a space strategy is a plan to use force and the threat of it with regard to outer space and the use of spacepower on Earth. Klein's *Space Warfare* reads on occasion as a space strategy for the United States, but at other times as an abstracted spacepower theory. The fluid switching between a space strategy and spacepower theory in Klein's work makes it difficult for the reader to discern a universal principle or theoretical truth from a specific plan of action for US space policy or strategy.[16]

This confusion is partly caused by a similar problem with terms like 'maritime strategy' and 'seapower theory.' Klein's ideas on spacepower and space warfare are derived from Julian Corbett's *Principles of Maritime Strategy*, and show the origin of the ambiguities in the language between spacepower theory and space strategy. Corbett's work is in effect a seapower theory that is meant to help planners and strategists develop *a* maritime strategy for whatever contingencies they face. The *principles* underlying any maritime strategy are in effect seapower theory, though Corbett himself does not use such terms in his definitions of maritime strategy and its relation to seapower, with

[15] Klein, *Space Warfare*, 3-7, 13, 35
[16] For example: Klein, *Space Warfare*, 6-15, 20-32, 87, 131, 163.

exception to the implication of the title of his book.[17] Education through theory, not prescription, is the objective.

Some authors believe that spacepower theory should be in the business of predicting spacepower's significance, delve into motivations of space-faring states, or altruistically theorise how best to secure the benefits of space for 'the global society.'[18] Prediction and in depth-analysis of the root motivations of behaviour is not the purview of strategic theory, beyond considering how the political characteristics and objectives of the war will influence strategic behaviour and war plans. Strategic theory assumes that there are at least two political units ready, willing, or at least preparing to use violence to achieve their goals. Beyond that, strategic theory, and therefore spacepower theory, has little to offer beyond understanding how and to what end a leadership wishes to make its violent political intent manifest under the given constraints. For example, Sadeh argues that:

> 'space developers and users worldwide share a set of basic strategic goals that serve as a common and shared basis for space strategy. These goals include: to secure the space domain for everyone's peaceful use; to protect legitimate space assets from the various types of threats; and to derive value from space assets for security, economic, civil, and environmental ends.'[19]

This is followed by a warning that a pitfall to avoid in a space strategy is to fail to 'understand and deter threats and adversaries.'[20] One can presume that a space strategy also needs to account for the means to 'address' such threats if deterrence fails. Although some objectives can be met without the use or threat of force, such a view escapes the violent and hostile heart of strategy which takes focus away from anything we may understand as 'war.'[21] Strategies and strategic theories are borne of violence and the intentional creation of death, suffering, and horror upon others for political

[17] Julian Corbett, *Principles of Maritime Strategy* (Mineola, N.Y.: Dover, 2004) 8-14
[18] Nicolas Peter, 'The New Space Order: why Space Power Matters for Europe,' *Space & Defense* 4:1 (2010) 58; Harding, *Space Policy in Developing*, 16- 21
[19] Eligar Sadeh, 'Introduction: Towards space strategy,' in: Eligar Sadeh, ed. *Space Strategy in the 21st Century* (Routledge, 2013) 2
[20] Ibid., 3
[21] Carl von Clausewitz, *On War*, Michael Howard and Peter Paret, trans., ed. (Princeton, N.J.: Princeton University Press, 1984) 76

objectives. It is dishonest, if not hypocritical, to claim that one is acting for the benefit of 'all' in space when one is also preparing to deny the use of that medium to others, or use that medium of outer space to kill, maim, and cause harm on Earth should the need arise.

In sum, spacepower theory is not a space strategy – just as a strategy is not strategic theory. Spacepower theory proposes a collection of ideas and propositions to educate the reader and develop her intuitive strategic thought regardless of the scenario at hand, whereas a space strategy would be an actual plan to deal with specific threats, contingencies, or campaigns that involve or threaten violence and destruction. Spacepower theory provides conceptual tools as starting points for analysis for any given scenario concerning spacepower, allowing an individual to adapt to the situation at hand based on constructive questions raised through the critical application of propositions which retain analytical usefulness regardless of the contingency at hand. This is the value and remit of spacepower theory. The individual is meant to use the concepts of strategic theory in their own education as a base for further analysis and to develop specific space strategies, which closely follows a canon of strategic theorists.

Pedagogy and strategic theory

Spacepower theory is a framework to build creative thought about a range of possibilities to guide decision-making and strategy-making. This spacepower theory not only launches terrestrial strategic concepts into orbit, but carries aloft a particular way of thinking with it. The educational and indeterminate nature of the theory must be grasped to prevent its misuse, lest a reader believe that the propositions of spacepower theory are unassailable maxims for a space strategy. This approach to strategic theory is articulated in modern scholarship by Jon Sumida's pedagogical interpretation of Clausewitzian theory, and is at home with the educational intentions of Alfred Thayer Mahan, Julian Corbett, and Raoul Castex as well.[22] This theory is to guide one in their preparatory strategic

[22] Sumida, *Inventing,* xv-xviii, 6-7, 44, 67, 69; Jon Sumida, *Decoding Clausewitz: A New Approach to* On War (Lawrence: Kansas University Press, 2008) 5, 100-101, 119-120, 170; Clausewitz, *On War*, 156-158; Sumida, *Inventing,* xv-xviii, 6-7, 44, 67, 69; Corbett, *Principles,* 1-9; Raoul Castex, *Strategic Theories*, trans. and ed. Eugenia C. Kiesling (Annapolis, M.D.:Naval Institute Press, 1994) 21-25

education, not to accompany them onto the battlefield or the situation room.[23] Spacepower theory aims to encourage a mind to combine discipline (universal concepts) with intuition (solutions to the many different manifestations and perceptions of the propositions) so that one can constructively leap from the general to the particular, and back again, to sharpen strategic judgment.[24]

Clausewitz was concerned with attempting to match his universal observations of the nature of war with the ever-changing particular characteristics of individual conflicts. He maintained that 'war, though conditioned by the particular characteristics of states and their armed forces, must contain some more general – indeed, a universal – element which from every theorist ought above all to be concerned.'[25] He balanced the tension between 'too great an emphasis on the universal [that] leads to the Scylla of banal generalities and dull truths,' and an 'emphasis on the particular [which leads] to the Charybdis of mindless trivialities and sterile pedantry.'[26] To maintain a balance between universal truths and particular variations in reality – or historicism – a theory of war must retain a balance between those abstract elements of passion, reason, and chance.[27] Spacepower theory, likewise, must retain a balance between its abstract and universal concepts. The command of space cannot be dominated by any one aspect, such as space control, denial, or decisive battle. Securing or contesting the command of space is the purpose of space warfare and the violent exercise of spacepower, but its manifestation in reality will change with the style of warfare of the day, the political demands of the belligerents, and the emotional and passionate drives caught up in the maelstrom of war. In this way, the idea of the command of space, as explained below, should retain conceptual validity in the face of technological change, so long as humans continue to use outer space as a medium to communicate, harvest, and deploy resources for strategic effects.

Spacepower theory, as a type of strategic theory, should help its readers ask, answer, and understand questions such as: What form of space warfare and consequences on Earth can be expected? So what for the lives of humans on Earth? How would commanding space affect the war as

[23] Clausewitz, *On War*, 141
[24] Harold R. Winton, 'An Imperfect Jewel: Military Theory and the Military Profession', *Journal of Strategic Studies* 34:6 (2011) 874
[25] Clausewitz, *On War*, 593
[26] Waldman, *War, Clausewitz*, 42
[27] Clausewitz, *On War*, 89

a whole? Spacepower theory will not by itself provide answers to these questions – but it can frame problems that might assist analysts and strategists in developing their own answers to such questions. In Echevarria's words, Clausewitz's work 'is an effort to spare readers the burden of recreating the universe of war, so to speak, whenever they needed to learn about war through books. Clausewitz performed the taxing and time-consuming labor for them.'[28] Spacepower theory aims to quicken, sharpen, and critique analyses of particular cases of modern warfare which rely on spacepower or exhibit space warfare itself. This theory charts the realm of possibility in history, the present, and the future, but it does not prescribe any single course of action. Universal propositions and concepts help judge the particular manifestation of warfare against the possibilities of theory by imposing mental order on the chaos of reality. This would enable an observer or practitioner to answer the 'so what?' question to any act of spacepower or space warfare with reference to the command of space and its exploitation for an overall war effort.

Jon Sumida argues that 'Clausewitz does not believe that any theoretical formulation… can prescribe the actual conduct of war. But this does not rule out the use of theoretical propositions to set the terms of thinking about a strategic problem… raising questions rather than providing answers.'[29] Reducing the potential sources of error through a poor strategic education is a necessary part of modern military education. Existing understandings of warfare and strategy – its political nature, paradoxical logic, non-linearity, and uncertainty – apply to space warfare and the employment of spacepower in grand strategy.[30] Any discussion on the grand strategic contributions of spacepower in war must begin with the command of space – how to achieve it, what its influence may be, and how different activities contribute towards or exploit it. The command of space gets the student started in ordering what she knows about space warfare into a strategic context.

Critical thinking in the intelligent application of propositions are the ideal outcomes of spacepower theory. This in turn produces a 'sensibility' or a 'mental character' that can provide a

[28] Antulio J. Echevarria, *Clausewitz and Contemporary War* (Oxford: Oxford University Press, 2013) 26
[29] Sumida, *Decoding*, 99, 180
[30] Luttwak argues this throughout his book: Edward N. Luttwak, *Strategy: The Logic of War and Peace* (London: Harvard University Press, 1987)

degree of sound understanding and a platform for further learning, especially in the absence of direct or extensive experience.[31] This attitude is shared by Alfred Thayer Mahan and Julian Corbett. Self-education through pondering strategic theory and military history helps hone the individual's command judgment, as Corbett believed that theory was for education and deliberation, but not execution.[32] Mahan's argument in the seminal *Influence of Sea Power*, according to Sumida, was that the principles on the utility of seapower in geopolitics had instructional value in a liberal arts education, and such principles had only an indirect value for the execution of plans.[33] Critical thought in applying the principle of seeking decisive battle is what develops strategic judgment in the individual and forms the pedagogical process of seapower theory. Although preferable, both Mahan and Corbett argued that destroying enemy forces is a rare opportunity and it should not blind commanders to believe the destruction of enemy forces at sea is always worth pursuing at all cost.[34] They argued that battle is good to seek if it is feasible, but sometimes it is not feasible and should not be pursued. Seeking battle for the command of the sea was an organising proposition to help train judgment as to when to seek battle or not. Seeking battle was not an axiom for unquestioned strategic success at sea.

Such a mentality is also exhibited among other strategic theorists. Although there is a risk of 'reading us in them' or the 'myth of doctrine,'[35] the arguments employed by many authors establish a persuasive canon of educational strategic theorists.[36] For strategists, commanders, and scholars, the purpose of pure strategic theory, and therefore spacepower theory, is not to develop a worldview that predicts every particular eventuality or anomaly in advance. It is, rather, 'to understand why wrestling with these questions can bring better insight into the nature of war,' which in turn should improve the

[31] Sumida, *Decoding*, 101
[32] Ibid., 3
[33] Sumida, *Inventing*, xv, xviii, 2-7
[34] Mahan, *The Influence of Sea Power Upon History 1660-1783* (Boston: Little, Brown, 1890) 338-339; Corbett, *Principles*, 99-100, 103-104, 113-118
[35] George Lawson, 'The eternal divide? History and International Relations,' *European Journal of International Relations* 18:2 (2010) 206
[36] Michael I. Handel, *Masters of War: Classical Strategic Thought* (London: Frank Cass, 2001) 3; Miyamoto Musashi, *The Book of Five Rings*, Thomas Cleary trans., ed. (London: Shambala, 2003) 14, 28; Sun Tzu, *The Art of Warfare*, trans. and ed. Roger T. Ames (Ballantine, 1993) in: Caleb Carr, ed., *The Book of War* (New York, N.Y.: Modern Library, 2000) 74

quality of analysis and decision-making in the practice of strategy and warfare.[37] Clausewitz insisted that 'the influence of theoretical truths on practical life is always exerted through critical analysis rather than through doctrine… their suitability in any given case must always be a matter of judgment.'[38] The command of space helps establish theoretical truths about spacepower and space warfare, from which minds can critically analyse events and scenarios, but not derive maxims or silver bullets from for strategic success. A form of the command of space is what space warfare seeks to achieve – but the way it manifests in reality and its overall contributions to a war will vary from one case to the next, therefore judgment is needed on applying the concept in practice. That form of command can mean an overbearing dominance of outer space, or a momentary clash or diversionary ploy to distract or cripple a spacepower at a critical time for operations on Earth. It is hoped that this article's central concept of the command of space triggers constructive and sustained strategic thought about outer space, with spacepower theory and the hypothetical thinking it beckons as the means to achieve it.

The command of space

The command of space must be exploited for spacepower to have strategic effects on Earth. This is true regardless of the type of weapon or method employed. Whether through a nuclear strike, a space blockade, or a comprehensive jamming effort, they must all be made in reference to controlling or denying the command of space for supporting the ultimate purposes of the conflict at hand. The command of space connects specific acts of or engagements in space warfare from the tactical and operational levels towards a higher plane of strategy and grand strategy; linking tactical space activity to the war's ultimate political object. Space warfare is the continuation of Terran politics by other means, and the command of space connects space warfare to those wider political goals.[39] The command of space is an overarching concept of spacepower theory because the sub-concepts of space control and space denial are intimately related and frequently overlap in terms of their effects. Despite

[37] Handel, *Masters*, 7
[38] Clausewitz, *On War*, 156, 158
[39] Paraphrasing Clausewitz, *On War*, p. 87

their different emphases and connotations, both control and denial are sought in order to secure or contest the command of space and prepare for its exploitation on Earth.

The command of space encourages a space-centric mode of thought in without undermining the necessity of 'joint' military thought. Space specialists must be able to communicate their unique capabilities and needs to the wider civilian and military capabilities, interests, and structures of a modern military power. The command of space is fundamental because it is the conceptual connection between a top-level grand strategy and the particular space strategies, operations, and tactics of space warfare in a war. Who controls or is denied the medium of space for strategic effect on Earth is what drives space warfare and gives it strategic meaning and political purpose. Whether a high-altitude nuclear strike from North Korea disables American and Allied spacepower, or the United States isolating Iraq from space communications in a space blockade, such actions can be conceptually connected in how they are undertaken to dispute the command of space or exploit the effects of such command on Earth. Without a clear understanding of what space warfare may contribute towards, discussions regarding the strategic implications of space weapons (including Earth and space-based kinds) will remain in a political vacuum, devoid of meaning and insight for war plans that are focused on achieving political objectives on Earth. However fought, space warfare is waged to influence the command of space.

Who commands space, and how a particular factor influences that command must have a tangible effect for grand strategy and wider objectives on Earth. Paul Kennedy defines a grand strategy as the bringing together of all the 'elements, both military and nonmilitary, for the preservation and enhancement of the nation's (wartime and peacetime long term) interests.'[40] Spacepower is embedded within this larger context – and the command of space, whether it is primarily held more in terms of controlling a vast space infrastructure or denying the use of the enemy's own must contribute to the wider war and long-term grand strategies of the actors involved

[40] Paul Kennedy, 'Grand Strategy in War and Peace: Toward a Broader Definition', in: Paul Kennedy, ed., *Grand Strategies in War and Peace* (London: Yale University Press, 1991) 5

in spacepower. Spacepower must take grand strategy into account, and grand strategy in the Space Age must take the command of space and its exploitation into account.

Therefore, the command of space forms a two-way connection between spacepower and grand strategy, much in the same way that the command of the sea makes the student or practitioner think of the role of seapower in a wider war based on the control, denial, and exploitation of the sea. A power's grand strategy, existing capabilities, geographic, and technological features will condition how their command of space manifests and how they may engage in a space warfare campaign. At the same time, they must also accept the physical realities inherent in struggling over the command of a medium such as outer space, and must be able to orchestrate varying capabilities in controlling or denying that medium, or both, depending on the circumstances of the case at hand. Regardless of the actor, the command of space, with the sub-concepts of control and denial, are universally relevant in space warfare. To have any strategic meaning any action must help control or deny that medium, to contribute to the overall command of space, which then allows for the exploitation of that medium for the war on Earth. Such is the foundational theoretical truth espoused by spacepower theory, as derived from seapower theory. This point may seem obvious or banal, but this concept is the foundation from which further strategic concepts for spacepower theory are developed from, both below in this article and in a forthcoming monograph.

In greater detail, the command of space means that the strategic object of space warfare is always to secure and/or deny the use of celestial lines of communication where objects and information travel in, from, towards, and through space.[41] The command of space can be influenced by either seeking to achieve space control or engage in space denial (also known as 'counterspace') operations, or both. In practice, control and denial are not mutually exclusive; doing one usually involves executing some degree of the other, much like Clausewitz's thinking on the intimacy of the connections between the defence and the offensive.[42] Commanding space is not the same as controlling or denying space infrastructure. Being in command of relevant parts of space is not

[41] Trevor Brown, 'Space and the Sea: Strategic Considerations for the Commons' *Astropolitics* 10:3 (2012) 237
[42] Clausewitz, *On War*, 357, 370

synonymous with controlling relevant space infrastructure; indeed, denying the use of certain orbits means only that one is commanding the use or non-use of certain orbits. This means that a power without an elaborate space infrastructure, but with rudimentary Earth-based antisatellite weapons, can contest the command of space through a space denial campaign. This means that an influence can be exerted on outer space without a large presence in that medium. A North Korean scorched orbit strategy employing high-altitude nuclear detonations may be an example. However, commanding relevant areas of space for a comprehensive spacepower would translate into more space control options as a matter of course.

Space control is conceived as a sub-concept of the command of space so that the theory is also distanced from the concept of space control as used in the narrow confines of the American doctrinal and policy-advocacy space weaponisation debates, where one school is termed as 'space control.'[43] Space control in this spacepower theory is one form of visualising the command of space with a mind to possessing and exploiting an elaborate space infrastructure (satellite constellations, extensive terrestrial down- and up-link communications hubs, launch complexes, etc.). Controlling space *tends* to denote an ability to use one's own most essential celestial lines of communication without major disruption. Visions of space control tend to gravitate towards a large, perhaps dominating space power that harnesses spacepower for terrestrial warfare and economics on Earth.[44] When it controls space, it can make its spacepower felt in terrestrial conflict with ease and confidence in the most vital occasions. Spacepowers such and the United States and China (especially as time progresses) are examples of states that would seek to ensure space control through their command of space for their modernised forces.[45] This has some comfortable parallels to aspects of seapower theory, which are explored below.

[43] Klein, *Space Warfare*, 60, 175, note 1. On the control school doctrine, see: David E. Lupton, *On Space Warfare* (Montgomery, A.L.: Air University Press, 1998) 60-69

[44] This dominating vision is prevalent in spacepower texts: Klein, *Space Warfare*, 60; Smith, *Ten Propositions*, 74; James Oberg, *Space Power Theory* (Montgomery, A.L.: Air University Press, 1999) 130; Gray and Sheldon, 'Theory Ascendant'; Dolman, *Astropolitik*, 8, 70-75, 130-134

[45] On Chinese military space modernisation see: Kevin Pollpeter, 'Space, the New Domain: Space Operations and Chinese Military Reforms,' *Journal of Strategic Studies*, (2016) Published online, http://dx.doi.org/10.1080/01402390.2016.1219946

Space denial, meanwhile, *tends* to connote a weaker space power attempting to deny that elaborate space infrastructure to a dominant space power. Denying (or attempting to deny) the use of celestial lines of communication *is still* attempting to command space. A power being able to deny celestial lines of communication still possesses a command of space. A successful denial operation – like crippling a few select satellites – may enable successful military operations on Earth whilst an opposing spacepower's usual support networks are impaired. These are crude depictions of denial and control, but they are useful to highlight the core difference between the terms – denial tends to prevent an enemy exploitation of an elaborate space infrastructure, whilst control intends to enable the exploitation of space infrastructure. Whether a belligerent's space strategy in a particular war rests upon ensuring space control or space denial, they are both concerned with influencing the command of space in their favour, and must exploit it for strategic effect on Earth. In practice, however, large powers may engage in space denial.

The command of space offers a term that helps bridge the complementary dualities of space control and space denial, highlights their common purpose, and determines their effect on the wider war. Any act of space warfare – framed as part of control or denial operations – must significantly impact the command of space to have any chance of being strategically meaningful. Control and denial signify different activities, yet they often impact on each other and no strictly exclusive categorisation should be made in practice, particularly as control and denial can be employed by both large and small spacepower to varying degrees. Whether an action fits more into a denial or control framing could depend on its context and particular effects, rather than on the means used. This is especially important given the use of 'control,' denial,' 'offensive,' and 'defensive counterspace' terms in space doctrine language.[46] This corresponds to Clausewitz's practical approach to terms that drive at the heart of concepts, but are blurred at their edges.[47] Such is the case with space control and denial, which have distinct cores but blurred boundaries. The symbolic ambiguity of weapons

[46] UK Ministry of Defence, 'UK Air and Space Doctrine', Joint Doctrine Publication 0-30 (2013) 7-7 – 7-14; US Joint Chiefs of Staff, *Joint Publication 3-14: Space Operations* (2013) II-8 – II-9.
[47] Clausewitz, *On War*, 486

systems,[48] and consequently military action, makes any *declaration* of a military action as a defensive campaign or an offensive manoeuvre a highly charged political act and does not provide more objective and strategically accurate terms.

For example, a U.S. space control campaign could be aggressively pursued by denying Chinese access to and the use of outer space, whilst the war on Earth may be on the strategic defensive for the United States and its allies following a Chinese offensive in the South China Sea and the Taiwan Strait. Such a campaign would see both China and the United States engage in space control and space denial operations in various forms and degrees, as both have spacepower-integrated terrestrial forces. Both would be contesting each other's command of space, but if China succeeds in only denying the use of space to the United States yet fails in its own space control campaign it would be an entirely different to scenario to succeeding at both. A working Chinese command of space would be heavily characterised by its space denial against the United States, but it would not have any more control over its own space systems. But that is yet only *a form* of a Chinese command of space, achieved by Earth-based space denial weapons.

Another possibility is that a Chinese space denial campaign may assist its space control operations, and vice versa. Whether U.S. space control efforts were significantly dented may even determine the conflict to a greater extent than American space denial efforts against Chinese spacepower, owing to China's still-developing dependence on spacepower for terrestrial operations. Without either side contesting the command of space – without an incidence of space warfare – both sides would enjoy a degree of space control over their own space infrastructure to allow unfettered space-enabled precision warfare and networked forces. At the heart of this is the notion of space control as securing and taking advantage of space infrastructure, whilst denial is about preventing the use of such infrastructure. Both control and denial are equally valid sub-components of commanding and exploiting space, and does not have any absolutist quality or retain relevance only for large spacepowers. This vision of commanding a medium has precedents in seapower theory.

[48] Ken Booth and Nicholas J. Wheeler, *The Security Dilemma: Fear, Cooperation, and Trust in World Politics* (Basingstoke: Palgrave Macmillan, 2008) 1, 4-5

The wrath of Mahan: Precedents from seapower theory

The general notion of commanding the medium has obvious parallels to the sea, and the somewhat intuitive analogy from the sea to space is not new. What is new in this article, however, is that it lies to rest some of the inaccurate distinctions made between Corbett's and Mahan's thinking on the command of the sea and the role of seeking battle. The spacepower theory literature is troubled by problematic readings of source analogies – in this case seapower theory – which this section attempts to rectify by producing coherent ideas about spacepower theory based on a unified approach from Mahan and Corbett. Their unity makes it easier to develop the permeability of the command of space, the contingent decisiveness of such command, and the roles of support from orbit and (in)decisive battle against space systems.

Many spacepower theorists have analogised from the sea to space. Colin Gray claims that 'controlling space is the idea that most usefully directs attention to the emerging status of the space environment as a (global) combat "theatre."'[49] Furthermore, he also argues that the basic idea of commanding the sea as analogous to commanding space 'accommodates the minor qualifications… that our space/sea forces will suffer some harassment and losses in space/at sea, and that the enemy will be able to secure erratic and minor-scale access to some orbits/put to sea in a small way.'[50] Martin E.B. France made some observations on Mahan's conditions of sea power as having parallels with spacepower, but is essentially a taxonomy that does not explicitly promote strategic thought.[51] Everett Dolman's *Astropolitik* advocates dominating the medium through geopolitically-derived chokepoints in accessing orbit and various transfer routes and lanes of commerce into other regions of the cosmos.[52] John Klein's work made an important contribution by analogising Corbett's core seapower theory.[53] The notion of commanding the sea translates well enough into orbit, so much so

[49] Colin S. Gray, *Another Bloody Century: Future Warfare* (London: Weidenfeld & Nicolson, 2005) 308
[50] Colin S. Gray, *The Navy in the Post-Cold War World* (Philadelphia, P.A.: Pennsylvania University Press, 1994) 156-157
[51] Martin E.B. France, 'Back to the future: Space power theory and A.T. Mahan', *Space Policy* 17 (2000), 237-241
[52] Dolman, *Astropolitik*, 8, 70-75, 130-134
[53] Klein, *Space Warfare*, 24-28, 51-60. See also: John G. Fox, 'Some principles of space strategy (or 'Corbett in Orbit'),' *Space Policy* 17 (2001) 7-11

that merely changing key naval terms to refer to outer space does the concept justice in Corbett's own words:

> 'By winning [the] command of [space] we… [place] ourselves in position to exert direct military pressure on the national life of our enemy [on Earth], whilst at the same time we solidify [a barrier] against him and prevent his exerting direct military pressure on ourselves… [The] command of [space], therefore, means nothing but the control of [celestial] communications, whether for commercial or military purposes. The object of [space] warfare is the control of communications, and not, as in land warfare, the conquest of territory.'[54]

What has been missing in previous seapower analogies to outer space is an acknowledgement of the apparent unity that the seapower theorists display over their understanding of the command of the sea. Mahan, like Corbett, noted the permeable and variable nature of the command of the sea; it is not absolute even after a decisive engagement.[55] Through the creation of spacepower theory, an insight into the subtleties and commonalities between Mahan and Corbett which is lacking in existing works may be gained.

The value of the apparent conceptual agreements between Mahan and Corbett is shown in four truths that develop the command of space. The first is that the idea of the command of the sea has been mistakenly taken to mean an ability to command all of the sea at all times, rather than controlling or denying select areas for specific timespans.[56] This means that the command of space is a concept that is useful for small and large space powers to judge their space warfare efforts against because spacepower theory charts possibilities and alternatives. Spacepower theory makes no positive claims as to how easy or difficult it is to secure varying levels of command in any given case. Any condition of the command of space has to take into account any relevant party's ability to control and deny outer space. Commanding space is not synonymous with dominating it, as is sometimes inferred through the notion of command of the sea.[57] The permeable and relative nature of the command of sea

[54] Corbett, *Principles*, 87
[55] Mahan, *Influence*, 14
[56] Geoffrey Till, *Seapower: A guide for the 21st Century* (Abingdon: Routledge, 2013) 145
[57] John R. Hill, *Maritime Strategy for Medium Powers* (London: Croom Helm, 1986) 35

is also transferred to outer space, meaning that a 'good enough' degree of command is the objective, rather than absolute dominance. What matters in practice is a good enough command, or 'reasonably secure communication,' as Mahan put it.[58] The command of the sea is therefore not an archaic concept relevant only to large powers. This aspect is a relatively simple point, but it is crucial to comprehend the complexity and variability of the command of space.

A second theoretical truth drawn out from Mahan's and Corbett's seapower theories is that commanding space – whether through denial, control, or both – is not *inherently* decisive. It may or may not be, depending on the situation. Spacepower or space infrastructure is not always amenable to being described as a centre of gravity and determining of future wars on Earth, contrary to what some spacepower theorists have envisioned.[59] A centre of gravity can be anything that represents 'the hub of all power and movement, on which everything depends. That is the point against which all our energies should be directed.'[60] A space strategy for the United States today may have many reasonable grounds for describing its spacepower as a centre of gravity, which would make securing the command of space through a space control-orientated space strategy an understandable preoccupation. The US military would undoubtedly be severely disrupted, if not debilitated, should its military communications and navigation satellites be denied. But a spacepower theory – which must be relevant to all scenarios involving spacepower at any time in any circumstance – cannot claim that space is as important to every entity in every situation, especially as major space powers continue to fight low-technology and non-state adversaries. This demonstrates the importance of distinguishing the particular from the universal; the space strategy from the spacepower theory. This is not to diminish the importance of spacepower for the major actors of today – but it is to caution against the unthinking application of the centre of gravity to develop a silver bullet for future wars.

[58] Mahan, *Influence*, 514
[59] Howard Kleinberg, 'On War in Space', *Astropolitics* 5:1 (2007) 9-10; Steven Lambakis, *On the Edge of Earth: The Future of American Space Power* (Lexington, K.Y.: Kentucky University Press, 2001) 101; Marc J. Berkowitz, 'National Space Policy and National Defense', in: Peter L. Hays and James M. Smith, Alan R. Van Tassel, Guy M. Walsh (ed.) *Spacepower for a New Millennium* (London: McGraw-Hill, 2000) 50-51; Benjamin S. Lambeth, *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space* (Washington, D.C.: RAND, 2003) 99
[60] Clausewitz, *On War*, 595-596

A third truth based on seapower theory is that spacepower is a source of support for the primary theatre of a conflict and infrastructure on Earth, and commanding space to exploit or deny this supporting capability is the *ultima ratio* of space warfare. That support, or its denial, must have consequences on Earth for the resources paid into them to pay dividends in war. Corbett famously declared that:

> 'Since men live upon the land and not upon the sea, great issues between nations at war have always been decided – except in the rarest of cases – either by what your army can do against your enemy's territory and national life, or else by the fear of what the fleet makes it possible for your army to do.'[61]

Again, the desire to not ascribe any declaration an axiomatic quality is evident by still allowing for a rare case in which a conflict may be decided at sea. Spacepower and commanding space is most important in what it allows you to do on Earth, to borrow Corbett's language above. In the same vein, Mahan theorised that:

> 'the service between the bases and the mobile force between the ports and fleets is mutual. In this respect the navy is essentially a light corps; it keeps open the communications between its own ports, it obstructs those of the enemy; but it sweeps the sea for the service of the land, it controls the desert that man may live and thrive on the habitable globe.'[62]

This view of seapower's supporting functions translates extremely well to contemporary spacepower and how modern force-enhancement, economic development, and environmental monitoring on our habitable globe are provided by spacepower.

Mahan did not take the command of the sea to be decisive by itself – it needs to be consciously exploited for strategic effect. Mahan examined the failure of the French navy to exploit their decisive victory against the English at Beachy Head in the Nine Years' War (1688-1697) by not acting to cut off English communications to Ireland. The same theoretical truth is valid for

[61] Corbett, *Principles*, 14
[62] Mahan, *Influence*, 329

spacepower. Whichever military service – or even civilian agency – provides spacepower for a political entity essentially subordinates its activity to the needs of people, entities, and political ambitions on Earth. It is important for spacepower theory to consider the non-battle and supporting aspects of spacepower, much as Corbett and Mahan did with seapower. There is a large body of literature on space weaponisation that unduly draws attention to embryonic or non-existent space-based weapons at the expense of examining the ramifications of Earth-based weapons systems and the support and force enhancement functions that defines contemporary spacepower.[63] Exacting critiques of this literature have been written elsewhere and will not be repeated here.[64] The benefits accrued from space systems – such as precision bombing and precision agriculture, the digital banking system, and continent-wide instantaneous wireless communications – affect death and taxes on Earth in a much more profound way than does an obsession with embryonic or latent space-based weaponry.

This does not mean that the army should dictate everything a navy does, or that terrestrial forces must rigidly control 'space forces.' But in strategic terms, a supporting medium must ultimately contribute objectives to where humans live and a grand strategy's objective. Placing weapons in outer space, for example, may be a waste of resources for the United States if the enemy can adapt to a loss of space infrastructure, target space-based weapons and valuable unarmed satellites with ground-based weapons systems, or retaliate with escalatory measures such as nuclear weapons. Understanding what these scenarios mean in strategic terms relies on space specialists being able to make spacepower and space warfare relevant and integrated into terrestrially-focused states and political interests, and not treating events in space security in a vacuum separated from concerns on Earth. The command of space not only helps visualise the kinds of competition that may occur in

[63] For example: Alan Steinberg, 'Weapons in Space: The Need to Protect Space Assets', *Astropolitics* 10:3 (2012) 248-267; Raymond Duvall and Jonathan Havercroft, 'Taking sovereignty out of this world: space weapons and empire of the future', *Review of International Studies* 34 (2008) 755-775; Joan Johnson-Freese, *Heavenly Ambitions: America's Quest to Dominate Space* (Philadelphia, P.A.: University of Pennsylvania Press, 2009); Matthew Mowthorpe, *The Militarization and Weaponization of Space* (Lanham: Lexington Books, 2004) 3-13; Columba Peoples, 'Assuming the Inevitable? Overcoming the Inevitability of Outer Space Weaponization and Conflict', *Contemporary Security Policy* 29:3 (2008) 502-520; Michael Moore, *Twilight War: The Folly of US Space Dominance* (Oakland: Independent Institute, 2008)

[64] For example: Karl P. Mueller, 'Totem and Taboo: Depolarizing the Space Weaponization Debate', in John M. Logsdon and Gordon Adams, ed. *Space Weapons: Are They Needed?* (Washington, D.C.: Space Policy Institute, 2003); Laura Delgado Lopez, 'Predicting an Arms Race in Space: Problematic Assumptions for Space Arms Control,' *Astropolitics* 10:1 (2012) 49-67

space warfare, but also insists on large-scale and multi-environment strategic thinking. This spacepower theory encourages thought on the influence of spacepower upon Earth as well as the strategic dynamics of space warfare. This is a reflection of Corbett and Mahan's interests in the influence of seapower on the land. Judgment is required to decide when which course of action and organisation is needed, as instructed by the classical theorists. Sometimes, battle or destruction between Earth-based weapons and satellites may be necessary. Unfortunately, ceaseless debate on space weapons alone draws attention away from the actual use of spacepower in warfare and security policies. A complementary approach to spacepower theory based on stressing the commonalities in both the educational intent and content of Mahanian and Corbettian seapower theory not only promotes a reasoned grasp of space warfare, the supporting role of spacepower, and its inherently contingent influence on Earth, but also encourages a particular way of critical thought and strategic intuition.

The fourth and final value of engaging with the unified seapower theorists is that it accommodates the role of battle in a wider understanding of the inherently undetermined decisiveness of commanding a medium. Mahan did not argue that seeking battle was always the correct decision. Corbett used Mahan's own arguments to criticise the US Navy's foolhardy decision to axiomatically pursue a decisive battle against the Spanish in the American-Spanish War, which neglected the more strategically-decisive and vulnerable US amphibious operations on Cuba.[65] Space warfare may entail Earth-to-space, space-to-space, and space-to-Earth operations that can involve physical destruction and electromagnetic disruption. The first two are feasible today with various methods. Decisive engagement with space systems in orbit or against terrestrial space infrastructure (such as control stations and spaceports) could lead to a more efficient command of space. Whether or not battle involves Earth-based antisatellite weapons or terrestrial strikes on ground-based space infrastructure, the role of engagements in spacepower will suffer the same theoretical truths as in seapower theory. The given tool of space warfare does not change the decisiveness of space warfare, nor of commanding space. This does not change whether Earth-based or space-based weapons are

[65] Corbett, *Principles*, 170-171

employed. Decisive battle would be the *ideal* method in theory for securing a command of space against a space power – but it may be difficult to bring about, and its result may well be strategically indecisive. This aspect of the theory is not encountered in John Klein's interpretation of Mahan's work. Klein writes that 'Mahan's strategic theory insists that the "proper sphere" of the fleet is offensive operations. Additionally, little attention is given to matters that are outside the direct action of navies and fleets.'[66] John Sheldon, too, criticises Mahan for fixating upon decisive battle. He argued that 'Corbett instead asserted that sea control… was the object because such control was local and temporary, then decisive battle for it was not always, if rarely necessary.'[67] This is a false dichotomy between Mahan and Corbett. These interpretations are in stark contrast to Mahan's understanding of the 'incorrectness' of the maxim of decisive battle in the Spanish-American war.

Such criticisms do not take into account Mahan's wider interests in the economic, bureaucratic, and cultural aspects of sea power, and his recognition of wars where 'navies were of great direct military value, though they fought no battles.'[68] This is highly analogous to outer space today, where space-to-space combat is not a predominant concern. Earth-based anti-satellite weapons systems are only now maturing, if still lacking in quantity, and space-based weapons are an exotic and embryonic technology and should not disproportionately dominate strategic thinking about outer space. Space warfare does not need space-based weapons to be used, as Earth-based systems (such as so-called ballistic missile defences) can already intercept unarmed satellites providing services to Terran militaries and economies and low and medium Earth orbits. Destroying specific satellites is no guarantee of securing the command of space, if precedents set by seapower theory are borne out in orbit. If decisive battle in orbit is a risk, then the weaker side would naturally seek to undermine efforts to allow that decisive battle to happen, or enact alternatives to mitigate the strategic effects of such a battle. Corbett argued that 'the most thorny questions [British commanders] had to decide… was not how to defeat the enemy, but how to bring him to action.'[69] This action and reaction cycle

[66] Klein, *Space Warfare*, 20
[67] Sheldon, 'Reasoning,' 150
[68] Mahan, *Influence*, 14, 53-55, 193, 225-226, 514.
[69] Corbett, *Principles*, 167

would continuously change the odds and feasibility of encountering a battle, and that strategic logic applies to the cat-and-mouse relationship between satellites and counterspace weapons.

Reflecting on the Spanish-American War and the Russo-Japanese war, Corbett commented that 'what the maxim [of seeking decisive battle] really means is that we should endeavour from the first to secure contact in the best position for bringing about a complete decision in our favour, and as soon as the other parts of our war plan… will permit.'[70] Corbett went on, however, to claim that if the primary theatre of operations is on land, then efforts to secure a decisive battle must be tempered by the needs of the land war.[71] This has clear parallels to spacepower as we know it today. With spacepower being integrated into terrestrial support operations in more militaries across Earth, major spacepowers will be caught between the dual horns of spending resources on struggling for the command of space, or spending resources to exploit such command for strategic effects on Earth. Though the latter cannot be done without the former, the latter's absence makes the former strategically pointless. This should temper any desire exhibited by some spacepower theorists to dominate outer space for its own sake, or seeking decisive battle in space above all else, rather than attacking enemy support systems in space or exploiting one's own in joint warfare.[72]

The core ideas of the command of the sea – its permeability and the indeterminate and contingent role of decisive battle and commanding the sea itself – have utility for thinking about spacepower and space warfare through the critical analysis and application of its theoretical truths. The vista of seapower theory is spacepower's potential. Belligerents may have varying degrees of control and varying successes in denial *in certain orbits and certain times with certain space systems*. Tying space warfare into how it affects the command of space is the value of using Mahanian and Corbettian foundations from the command of the sea. A successful space warfare campaign may secure a control of space and allow a general command of space, but it by no means makes the enemy a powerless actor nor does it guarantee success on Earth. Judgment would be required to understand when a space warfare campaign may yet translate into tangible and significant benefits on Earth.

[70] Corbett, *Principles*, 209
[71] Ibid.
[72] Smith, *Ten Propositions*, 74; Oberg, *Space Power*, 130; Sheldon and Gray, 'Theory Ascendant?'

Expectations from the propositions of spacepower theory must be managed carefully by grasping the indecisiveness cautioned by seapower theory.

Conclusion

This article has made several arguments that highlight the theoretical truths of spacepower theory. Space warfare is waged for the command of space, which is about controlling or denying the use of space for oneself and the enemy. This foundational theoretical truth connects all activities of space warfare into a higher strategic level of comprehension. Destroying a satellite, for example, must meaningfully contribute to a command of space in either material or psychological ways or it is a waste of resources. Commanding space must then translate into effects on Earth to have an effect on grand strategy. If outer space is to be contested in future, every space power will be interested in commanding space to a good enough degree for its ends, whether through denying space infrastructure to others or controlling it for oneself. The command of space can manifest in unpredictable and diverse ways owing to the situation at hand. This has clear parallels to seapower theory, in both Mahan's and Corbett's works. The nature of such command is permeable and not absolute, as derived from seapower theory. The command of space does not assume an all-or nothing scenario; different sectors and altitudes of Earth orbit may be more or less contested by the enemy, and more or less useful in various conflicts. Space warfare does not herald certain death from above, nor does it provide a strategic panacea for terrestrial problems. The command of space must be consciously exploited for strategic effect on Earth according to the situation at hand.

The unity of thinking about seapower among Corbett and Mahan forms a stable conceptual core which focuses thinking of spacepower on commanding that medium and its communications. Mahanian and Corbettian seapower theories should be understood as complementary, not dichotomous, in both their educational intent and conceptual content, particularly in how they stress that the command of a medium is not inherently decisive by itself. The command of space is only relevant in how it allows spacepower to influence a wider war on Earth, and its strategic significance is not set in stone. Destroying or disrupting space infrastructure is not an end in itself; the command of space stresses the subordination of such means towards strategic ends on Earth. Similarly, seeking

battle in space should never be an end in itself. Seapower theory proposes that space battle will not necessarily be any more or less decisive than naval clashes in the context of seapower and grand strategy. Rather than portraying space infrastructure as a centre of gravity, judgment is needed from the individual to identify it, if one exists, and strike. Space may be a centre of gravity for some political actors, but not all, and some may prepare alternatives and redundancies.

Lastly, the key to grasping the value of seapower theory and spacepower theory is in their pedagogical roles in promoting flexibility in interpreting and applying theoretical truths. Yagyu Munenori put it in stark terms:

> 'It is sickness to be obsessed with winning, it is sickness to be obsessed with using martial arts, and it is sickness to be obsessed with putting forth all one has learned. It is sickness to be obsessed with offense, and it is also sickness to be obsessed with defense.'[73]

In order to properly use spacepower theory, and any strategic theory, Munenori's words must be heeded. Strategic theory helps chart possibilities but does not determine action. The command of space is important as the first proposition of spacepower theory because it forces the mind to sketch a 'big picture' for those wishing to learn to think strategically about the methods of space warfare, the development of outer space, and its consequences for modern warfare in the Space Age. Without commanding space for strategic effects, spacepower ceases to be strategically relevant. Flexible, critical, and intuitive strategic thought and analysis are needed to make the correct decisions in practical reality, for which there is no positive guide for action. But the command of space offers a starting template for systemic strategic thought. Without understanding the pedagogy and epistemology of such theory, there will always be a chance that a reader will attempt to divine axioms for success from such military philosophy.

Space is politically and militarily a rather familiar frontier; space warfare is merely the continuation of Terran politics by other means. The command of space merely marks the conceptual launch point for systemic strategic thought about outer space. It is hoped that this article broadens the

[73] Yagyu Munenori, *The Book of Family Traditions on the Art of War*, trans. ed., Thomas Cleary 1632 in: Miyamoto Musashi, *The Book of Five Rings*, Thomas Cleary trans., ed. (London: Shambala, 2003) 117

view of spacepower beyond the narrow confines of the (U.S.) space weaponisation debate. It is also hoped that it will encourage critical consideration of the influence of spacepower upon the present in a way that is not determined by technological and mechanistic thinking alone, echoing Mahan's own educational intent with a liberal arts education for Navy officers.[74] In this sense, the Mahan for the final frontier may well be Alfred Thayer Mahan himself.

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[74] Sumida, *Inventing*, 7, 24

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